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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/805,770	03/22/2004	Michael Durr	282743US8X	1234

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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
HALL, ASHA J	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
01/10/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/805,770	DURR ET AL.	
	Examiner	Art Unit	
	Asha Hall	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) *25-34* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-34* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :March 22, 2004 and January 22, 2007.

DETAILED ACTION

Election/Restrictions

1. In response to the Restriction Requirement filed on September 21, 2007, the Applicant's election of Group I: claims 1-24 filed on October 22, 2007 is acknowledged. This election is made with traverse.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

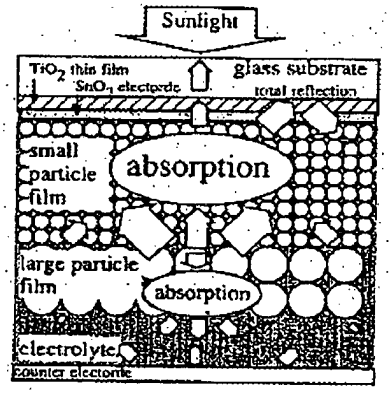
3. Claims 1-3, 6-8, and 19-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Usami ("Theoretical study of application of multiple scattering of light to a dye-sensitized nanocrystalline photoelectrochemical cell", Chemical Physics Letters, 277, (1997) pp.105-108).

In regard to claim 1, Usami discloses a porous film for use in an electronic device, in particular a solar cell (col. 1, paragraph 1, page 105), said film having a front face and a back face as shown in Figure 4, characterized in that said porous film has a gradient of light scattering strength extending from said front face to said back face (col. 1, paragraph 2, page 106), with the light scattering strength increasing towards said back face (col. 2; paragraph 2, page 108).

With respect to claim 2, Usami discloses the porous film according to claim 1, characterized in that said gradient of light scattering strength starts with zero light scattering at said front face(col. 2; paragraph 2, page 108).

As to claim 3, Usami discloses the porous film according to claim 1, characterized in that said porous film comprises two layers, each layer having a first kind of particles of one average diameter and one layer having additionally a second kind of particles having a larger average diameter as shown in Figure 4 (page 108, schematic given below).

First layer of particles
Second layer of particles



As to claim 6, Usami discloses porous film according to claim 3, characterized in that said particles have a shape of spheres and balls (col. 1; paragraph 2, p.106).

In regard to claim 7, Usami discloses the porous film according to claim 3, characterized in that said particles are selected from the group comprising semiconducting material particles, metal particles and insulating particles (col. 1;

paragraph 1, p. 105).

As to claim 8, Usami discloses porous film according to claim 3, characterized in .that the at least two layers/three layers/plurality of layers have been applied subsequently (col. 2; paragraph1, p.107).

In regard to claims19-24, Usami discloses the porous film according to claim 1, electronic device, such as a solar cell, comprising a porous film (col. 1; paragraph 1, p.105), an electrolyte (Figure 4), a reflective back electrode (col.2; paragraph 2, p.108 and Figure 4), and a light confinements layer (col.2; paragraph 2, p.108).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 4-5 and 9-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usami ("Theoretical study of application of multiple scattering of light to a dye-sensitized nanocrystalline photoelectrochemical cell", Chemical Physics Letters, 277, (1997) pp.105-108.) as applied to the above claims 1, 3, and 8 respectively, and in further view of Chone (EP 1,271,580).

In regard to claims 4 and 5, Usami discloses the porous film according to claim 3, but fails to disclose the porous film comprises of a plurality/three layers with each layer

having a first kind of particles of one average diameter, and at least one layer having additionally a second kind of particles having a larger average diameter.

Chone discloses a porous photoelectrochemical film with metal oxide (TiO_2) particles (abstract & paragraph 31) and further discloses in Figure 1, within the three levels/layers of metal oxide particles each layer has larger/ a first particles intermixed with smaller/ a second kind of particles (particle distribution of sizes within each lever/layer- paragraph 32) (abstract & paragraph 22). Chone teaches that small particles of sizes lower than 30nm and big particles of sizes higher than 100nm are such that they allow an improvement of the photon conversion efficiency of the cell by keeping the dye absorption area and by improving the light scattering effect (paragraph 27). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate a plurality or three layers of a first and second kind of particle diameters (particle distribution) as taught by Chone to the porous film of Usami in order to that the big and small particles allow to improve the photon conversion efficiency of the cell by keeping the dye absorption area and by improving the light scattering effect.

As to claim 9-14, Usami discloses the porous film according to claim 8, but fails to disclose that the at least two/three/plurality of layers have been applied subsequently by a technique selected from the group comprising screen printing, doctor blading, drop casting, spin coating, sol gel process and lift-off techniques, and any combination of the aforementioned techniques. Usami further fails to disclose the first kind of particles have an averag$_e$ diameter in the range of from 2 nm to 25 nm, preferably from 3nm to 20 nm, or they have an average length of from 3 nm to 300 nm, preferably from 10nm to 100

nm and a second kind of particles have an average diameter or length in the range of from 50 nm to 1 lam; preferably from 100 nm to 500 nm, more preferably from 200 nm to 400 nm.

Chone discloses a porous photoelectrochemical film with metal oxide (TiO_2) particles (abstract & paragraph 31) and further discloses that the layers have been applied by drop casting and doctor blading (paragraph 40). Chone discloses that the smaller particle size ranged from 10-30nm and the larger sizes ranges from 100-200nm with volume a ratio of 10:1 of a big to small particle (assuming the comparison of the same individual particle for the volume ratio the weight ratio would be the same) (paragraph 26). Chone teaches that the drop drying and doctor blade method utitlized to obtain a film that had a particle size distribution (paragraph 40). Also, Chone further teaches that the particle distribution allows an improvement of the photon conversion efficiency of the cell by keeping the dye absorption area and by improving the light scattering effect (paragraph 27). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate a drop casting and doctor blading technique as taught by Chone to the porous film of Usami in order to form a particle distribution to allow an improvement of the photon conversion efficiency of the cell by keeping the dye absorption area and by improving the light scattering effect.

In regard to claim 15, Usami discloses the porous film according to claim 1, and further discloses in Figure 4 that one layer is composed of larger/a first kind of particles not incorporating into the layer of smaller/a second kind of particles, wherein the smaller

particles are composed of another layer without the incorporation of the larger particles, but fails to disclose a each layer having a first kind of particles of one average diameter, wherein in each of the layers having a second kind of particles, either

i) the average diameter of the second kind of particles is the same in each layer and the amount of the second kind of particles present in each layer varies from layer to layer, or

(ii) the amount of the second kind of particles present in each layer is the same in each layer and the average diameter of the second kind of particles varies from layer to layer.

Chone discloses a porous photoelectrochemical film with metal oxide (TiO_2) particles (abstract & paragraph 31) and further discloses in Figure 1, within the three levels/layers of metal oxide particles each layer has larger/a first kind of particles intermixed with smaller/ a second kind of particles (particle distribution of sizes within each lever/layer- paragraph 32) (abstract & paragraph 22). Chone depicts in Figure 1 that the average diameter 30-50nm (paragraph 22) of the second kind of particles is the same in each layer and the amount/density of the second kind of particles present in each layer varies from layer to layer (paragraph 60). Chone teaches that small particles of sizes lower than 30nm and big particles of sizes higher than 100nm are such that they allow an improvement of the photon conversion efficiency of the cell by keeping the dye absorption area and by improving the light scattering effect (paragraph 27). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate a plurality or three layers of a first and second kind of particle diameters (particle distribution) as taught by Chone to the porous film of Usami in order to that the

big and small particles allow to improve the photon conversion efficiency of the cell by keeping the dye absorption area and by improving the light scattering effect.

With respect to claim 16, Usami discloses the porous film according to claim 15, but fails to disclose wherein the amount of the second kind of particles present in each layer varies from layer to layer, it increases from layer to layer, and where the average diameter of the second kind of particles present in each layer varies from layer to layer, it increases from layer to layer.

Chone discloses a porous photoelectrochemical film with metal oxide (TiO_2) particles (abstract & paragraph 31) and further discloses metal oxide particles each layer has larger/a first kind of particles intermixed with smaller/ a second kind of particles (particle distribution of sizes within each lever/layer- paragraph 32) (abstract & paragraph 22). Chone further discloses within the three two layers of metal oxide particles each layer having a more dense layer than that of a less dense second layer closer to the cathode (paragraph 60). Chone teaches that denser layers (the number of particles in confinement increasing layer to layer) can have an improved dye adsorption in the layer close to the TCO/glass substrate and the redox couple diffusion flow can be improved in the second layer close to the cathode electrode therefore the current in the photoelectrochemical cell will flow without any restraint of the ionic flow also to enhance the light scattering effect (paragraph 60). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate a more dense layer that the second layer closer to the cathode with a less dens layer as taught by Chone to the porous film of Usami in order to have denser layers (the number of particles in

confinement increasing layer to layer) with improved dye adsorption in the layer close to the TCO/glass substrate such that the redox couple diffusion flow can be improved in the second layer close to the cathode electrode therefore the current in the photoelectrochemical cell will flow without any restraint of the ionic flow also to enhance the light scattering effect.

As to claims 17-18, Usami discloses the porous film according to claim 15, characterized in that the one layer: having only a first kind of particles is closer to said front face of said porous film than to said back face and is adjacent to said front face as shown in Figure 4.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asha Hall whose telephone number is 571-272-9812. The examiner can normally be reached on Monday-Friday 7:30-5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AJH

NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700